Measurement in conservation planning

Nijkamp, P.

1990

Faculteit der Economische Wetenschappen en Econometrie

Serie Research Memoranda

Measurement in Conservation Planning

P. Nijkamp

Research Memorandum 1990-65
November 1990

vrije Universiteit *amsterdam*

1. Elements of Conservation Planning

The recent history of conservation planning has clearly shown that the issue of development and conservation is not only politically relevant, but also analytically interesting (see among others Fusco Girard, 1987, and Nijkamp, 1989). Several attempts have been made at planning strategies. In recent years many - mainly descriptive -contributions have been made to analyse prevailing policies, strategies and measures in policy situations marked by conflicts between development and conservation. Furthermore, much attention has been devoted to conservation impact analysis which tries to assess the foreseeable physical, social and economic effects of conservation strategies by using appropriate analytical tools for integrating conservation into development planning.

The attention for conservation issues is apparent in both developing countries (e.g., Thailand, Mexico, Indonesia) and developed countries (e.g., Italy, the Netherlands, Greece). Especially in the framework of urban restructuring (e.g., urban renewal, transformation of urban functions, restructuring of urban environments) the conservation issue has become an important one, as here the conflict between 'high tech' versus 'high touch' developments is at stake. For instance in various cities the threat of urban degradation requires a physical and economic restructuring which very often is to the detriment of the historico-cultural heritage of the city. Despite many debates in this field, so far no uniformly acceptable urban development planning paradigm has emerged. While it is generally acknowledged that urban development means the creation of new assets in terms of physical, social and economic structures, it is at the same time recognized that each development process often also destroys traditional physical, social and cultural assets derived from our common heritage. Clearly, although not always immediately computable, all cultural assets represent an economic value which has to be considered in any urban transformation process. Unfortunately, in most cases the inclusion of such assets in the planning process cannot be left to the market mechanism, as most urban historico-cultural assets represent 'unpriced goods' characterized by external effects which are not included in the conventional 'measuring rod of money'. Thus the development of appropriate evaluation methods is of paramount importance here, as

otherwise a careful and balanced nurturing of cultural assets will never be realized.

However, the operational assessment of the socioeconomic and historico-cultural value of monuments - or the impacts of monument policy - is fraught with many difficulties. Monuments represent part of the historical, architectural, and cultural heritage of a country or city, and do not usually offer a direct productive contribution to the economy. Clearly, tourist revenues sometimes may reflect part of the interest of society in monument conservation and/or restoration, but in many cases this implies a biased and incomplete measure, so that monument policy can hardly be based on tourist values. On the contrary, in various places one may observe a situation in which large-scale tourism (sometimes marked by congestion) even affects the quality of a cultural heritage (Venice or Florence, for example).

The foregoing problems are especially relevant, because in the current period of budgetary constraints there is a risk that budget cuts in the public sector first will affect the 'less productive' or 'soft' sectors such as monument conservation, arts, and so forth. Therefore, it is necessary to pay due attention to the socioeconomic and historico-cultural significance of our heritage.

In the past, many economists have adopted the narrow conventional economic viewpoint that the meaning of a certain good can be derived in a proper way from the revealed preferences of economic agents who express their desires on an artificial market. It is, however, increasingly recognized that the socioeconomic and historical-artistic value of a cultural good is a multidimensional (or compound) indicator which cannot be reduced to one common denominator (such as the measuring rod of money). In fact, we are - from a planning viewpoint - much more interested in the 'complex social value' of cultural resources (Fusco Girard, 1987). This implies that the meaning of historical and cultural resources is not in the first place dependent on its absolute quantities, but on its constituent qualitative attributes or features (such as age, uniqueness, historical meaning, visual beauty, physical condition, artistic value, etc.). For instance, cities such as Venice, Florence, Sienna, or Padua would never have received an international reputation without the presence of intangible values inherent in their cultural monuments.

In order to clarify the meaning of our multidimensional approach, some general background observations on the preservation of our cultural heritage will be given first. The 1960s and 1970s showed a strong

dominance of economic evaluation tools in public planning (for example, cost-benefit analysis, cost-effectiveness analysis). A major stimulus to the use of such tools was given by the United Nations Industrial Development Organization, the Organization for Economic Cooperation and Development, and the World Bank. It was a widely held belief that a systematic application of rigorous economic thinking in evaluating and selecting public projects or plans would be a major instrument in improving the performance of the public sector (for instance, see Little and Mirrlees, 1974).

This conventional economic appraisal methodology mainly found its basis in welfare economics and was originally normative and prescriptive in nature, but it also implied various restrictive value judgements such as the emphasis on efficiency and the suppression of equity. Besides, the use of 'fictitious' shadow prices to assess benefits foregone was a major source of uncertainty in such project evaluations (see also Warr, 1982). Especially the aim to transform all relevant impacts into one common denominator, viz. the 'measuring rod of money', has become a source of major criticism (for an interesting review see Renard, 1986).

It is evident, however, that a compound evaluation of collective goods - and especially public capital goods such as churches, palaces, parks, landscapes, 'cityscapes', etc. - is far from easy and cannot be undertaken by the exclusive consideration of the tourist and recreation sector (see also Kalman, 1980; Lichfield, 1989). Especially in the Anglo-Saxon literature the expenditures made in visiting recreational destinations are often used as a proxy value for assessing the financial or economic meanings of natural parks, palaces, museums, etc. A geographically complicating problem here is the fact that such recreational commodities and the various users are distributed unequally over space. This means that recreational expenditures are codetermined by distance frictions, so that the evaluation of recreation opportunities has to take into account the transportation costs inherent in recreational and tourist visits. Consequently, the socioeconomic value of such recreational opportunities depends both on their indigenous attractiveness and on their location in geographic space. Therefore, increase of accessibility might then become an instrument in enhancing the socioeconomic value of cultural heritage. But the indigenous historico-cultural value of monuments is invariant with respect to geographical location (apart from the scale economies emanating from a 'socio-cultural complex'), so that we are still left with the problem of a compound evaluation. In order to provide a solid background for a

further discussion of the social impacts of our cultural heritage, we will first outline the methodology and principles of policy analysis and impact assessment in general.

2. Relevance of Impact Assessment

Measurement in conservation is a subject of the broad family of policy impact analysis. In the past years there has been a growing interest in assessing the socio-economic, cultural, environmental and distributional impacts of public policies. The high social costs of unintended and/or unforeseen consequences of various policy measures have necessitated researchers to develop new tools that are more suitable for gauging the effects of a wide array of policy decisions, amongst others in the area of urban, environmental, physical, infrastructure and cultural planning. At the same time the deficiencies of conventional evaluation tools, such as a traditional cost-benefit analysis, were recognized.

This awareness had led to the emergence of impact (assessment) analysis in many fields, e.g. technology assessment, social impact assessment, risk assessment, environmental impact assessment, performance measurement etc. All such techniques aim at anticipating the consequences of policy actions by providing a systematically organized procedure for impact assessment (see also Becker and Porter, 1986).

An **impact analysis** may be a meaningful tool for more integrated and coordinated planning strategies, as such an analysis described systematically the effects of changes in control variables on all other components of a system. Consequently, an impact analysis should pay attention to the **variety, coherence and institutional framework** of the system at hand. This implies that economic, spatial, social, cultural and environmental variables should be included as relevant components of the system. Preferably, an impact analysis should be based on a formal model.

A major problem inherent in impact assessment is the friction between the need for reliable, quantitive information and the usual availability of only qualitative, intangible information which cannot be readily quantified. Impact assessment has to play a role as a communication tool between different interest groups in a complex decision problem, and it is evident that discussions on controversial issues need a maximum of cardinal information in order to reach a higher level of consensus. Although the new logic of 'measuring the unmeasurable' may be

helpful in various cases (see Nijkamp et al., 1986), it is clear that in many situations impact assessments should fulfil the highest level of precision and accuracy. The intriguing contentiousness of decision problems, and the multidimensional and complex data situation of such problems need an orderly approach.

Given the pluriformity and variety among the elements of most social systems, a **multidimensional profile approach** is often a meaningful analytical method for considering systematically a wide variety of different aspects in such systems. This approach implies that a certain phenomenon in the system at hand is characterized by a **vector profile** with a set of different (multi-dimensional) components or attributes. For instance, cultural quality of a city is a multidimensional phenomenon which can only be represented in a useful way by means of a vector with elements such as the quality and size of museums, the availability of parks and recreation areas, the presence and quality of museums, the quality of cultural educational facilities, etc.

A main problem in a systematic organisation of an impact assessment is the question what and how to measure. The selection or identification of indicators to be measured is of critical importance in any impact assessment. Both the omission of relevant information and the supply of redundant information may lead to biased decisions. Thus impact assessment has to be oriented towards the needs of planners, so that in all relevant phases of a policy problem adequate information can be provided. This also means that in most practical situations there will be a need for monitoring and auditing, not only for project or impact management, but also for programme and policy development. Consequently, feedback mechanisms are a logical follow-up of impact assessment.

Although there will always be a natural tendency toward integrated and even comprehensive impact assessments (including simultaneously social, economic, cultural, distributional, technological or spatial impacts), it has to be realized that at the same time there is a need for scoping. If impact assessments become too broad, they will prove to become unwieldy for practical decision-making. This implies that impact assessment requires a systematic project definition, an organized data base or information system, and a clear identification of space and time dimensions. Only under such conditions uncertainty in prediction and planning can be reduced.

3. General Description of Impact Assessment Analysis

In general, the following requirements may be imposed on a meaningful impact assessment analysis:

- **consistency**: the relations should represent a set of coherent and non-contradictory system's interactions;
- **completeness**: the impact analysis should take into account the intended and unintended effects of external policies upon the system under consideration;
- **relevance**: the various impacts and their indicators should be meaningful from the viewpoint of policy-makers (e.g., in terms of urban and regional management);
- **uniformity**: the effects assessed by means of an impact analysis should reflect the variety and multidimensionality of the urban system concerned;
- **comparability**: the impact measures should allow a comparison with other impacts measured at different time periods or in different areas;
- **flexibility**: the impact system should provide comprehensible information which can be adjusted to the needs of users or to new circumstances;
- **data availability**: the impact analysis has to be oriented to the available data (including soft and qualitative information);
- **comprehensiveness**: the successive steps of the impact analysis should provide an integrated picture of spatial and socio-economic interactions including distributional impacts;
- **effectiveness analysis**: the assessed impacts should allow a confrontation with **a priori** set policy targets, so that the effectiveness of policy measures can be gauged.

In general, the multidimensional profile system alluded to in the foregoing section will satisfy the above mentioned methodological requirements. It is clear, however, that the accuracy of measurement in many impact studies may be fairly low due to lack of data, uncertainties regarding policy measures, or lack of insight into the structure of a complex dynamic system.

Of course, impacts have to be measured on a scale which is as accurate and appropriate as possible; frequently, however, only soft or qualitative information is available. For a meaningful policy analysis, this information should not be disregarded. Especially in the cultural

sector we are often facing a situation with limited precision on the necessary policy information.

In general, the following measurement scales may be distinguished:

- **nominal scale**: a classification into distinct groups (e.g., green or red) or into distinct size classes (e.g., small impacts and large impacts);
- **ordinal scale**: a ranking of events or effects in order of magnitude (e.g., 1, 2, 3, 4, ...);
- **cardinal scale**: a measurement system which allows a calculation of distances between effects, either in a relative sense (an interval scale) or in an absolute sense (a ratio scale).

The effects assessed in an impact analysis may be measured in any of these scales depending on the accuracy of the information. In case of a large set of ordinal measured impacts, it may sometimes be meaningful to transform the ordinal information into metric (cardinal) units by means of multidimensional scaling methods or alternative techniques (see Nijkamp, 1979). This is especially useful if one wants to reduce ordinal information in a long list of attributes of a certain profile to a limited set of main (metric) indicators of the profile at hand.

Examples of meaningful classes of main profiles in an impact analysis may be **inter alia**:

- **economic**: production
  investments
  labour market
  demand, etc.
- **housing**: quantity of dwellings
  quality of dwellings
  residential climate
  prices and rents, etc.
- **infrastructure**: accessibility (public and private transport)
  distance
  mobility (migration, commuting, recreation, shopping), etc.
- **financial**: taxes
  subsidies
  public expenditures
  distributional aspects, etc.
- **facilities**: health care
  cultural

		social
		recreational, etc.
-	**environmental**:	air pollution
		noise
		sewage systems
		congestion
		segregation
		density
-	**energy**:	energy consumption
		insulation of dwellings
		central urban heating syste,
		tariff system, etc.
-	**cultural**:	museums, theatres
		monuments
		recreational facilities
		cultural training facilities, etc.

Depending on the aim of a specific impact analysis, a choice among the foregoing impact profiles (including their levels of measurement) has to be made in order to design a coherent policy impact system.

In order to obtain a compound evaluation of socio-economic opportunities of monuments (museums, parks, palaces, etc.), a systematic typology of the societal functions of such public assets has to be made. In conventional economic approaches, such a functional classification forms the basis for a monetary assessment of the socioeconomic value of such goods (cf. Driver and Harris, 1981). In the framework of a broader analysis, the following typology of effects of recreation can be made (see also Filius, 1986):

(1) **Psychological** and **social behavioural** effects. Such effects emanate from an enhancement of mental well-being caused by an enjoyable visit to a valuable scarce cultural or environmental asset. Clearly, congestion (or excess demand) may lead to negative feelings of well-being.

(2) **Spin-off** effects. These broader indirect effects are the result of behavioural changes caused by visits to natural parks, cultural heritage, etc. and are, for example, reflected in productivity increases and decline in illness rates.

(3) **Effects on non-users**. Such effects are related to the potential value of a cultural asset even though this asset is not actually used. In this framework the notion of a so-called **option value** is relevant (Weisbrod, 1964). This concept may have various meanings (see also Hyman and Hufschmidt, 1983):

(a) risk aversion: potential visitors are not sure that they will ever visit the opportunity concerned, but do not want to lose the possibility to visit it in the (near or distant) future;

(b) quasioption demand: potential visitors have an interest in visiting the recreational good concerned, but prefer to wait until sufficient information is available;

(c) existence value: non-users attach a high value to the fact that the scarce socio-cultural asset is maintained, even when they do not plan to visit it;

(d) vicarious use value: non-users want to keep a certain public good intact, because they like it when others can enjoy this good;

(e) bequest value: non-users see it as their moral responsibility (or altruism) to protect and maintain a certain public good for future generations.

Consequently, the concept of option value is strongly related to the symbolic value of a good. However, a reliable monetary assessment of 'option values' in the framework of monuments is far from easy (Greenley et al, 1981).

(4) Effects on **regional development**. The presence of a scarce cultural or environmental asset is not only appealing for daily recreation, but also attracts many foreigners, whose spending capacity may be of great importance for regional development (for example, expenditures made in restaurants and hotels). Such revenues for the region may also exert various indirect multiplier effects in the region.

(5) Effects on **infrastructure** and **public management**. These effects refer to the fact that the maintenance of a public commodity requires the use of many instruments by the government, for instance, information supply, fire protection, waste disposal, daily maintenance, etc.

(6) **Environmental** effects. Any use of a public good has various (positive and negative) environmental consequences, and these social spillover effects have to be taken into consideration as well.

Sometimes it may be useful to employ a systematic tool in the form of an impact or effect matrix which reflects the effects of policy controls ($p_1, \ldots, p_N$) upon the systems components ($c_1, \ldots, c_I$) (see Figure 1).

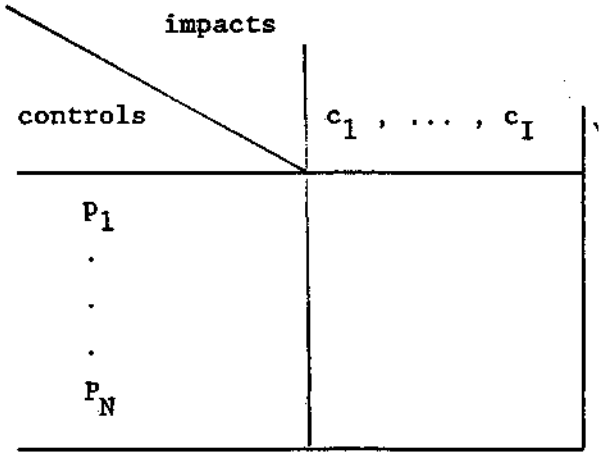

Figure 1. An impact matrix

An illustrative example of a spatial interaction system which might provide the information necessary to fill in the impact matrix is contained in Fig. 2.

Given the need to obtain a comprehensive picture of all relevant (intended and unintended) effects of policies, a system's approach may offer a practical frame of reference for policy impact studies. In general, a system's approach aims at portraying the processes and relationships in a complex system that encompasses various components which are linked together by means of functional, technical, institutional or behavioural linkages and which can also be influenced by changes in parameters or controls from the environment outside the system itself (see also section 4).

A good example of impact analysis in the cultural sector can be found in a study by Hietbrink et al. (1988). These authors have studied the economic significance of cultural amenities by investigating the impacts of investments in urban culture as part of the economic infrastructure of the city concerned. Their study concerned the city of Zwolle, the capital city of the province of Overijssel in the Netherlands. Cultural amenities referred here to all buildings with either a cultural function (e.g., theatres, concert halls, cinemas) or a function as a monument (including old dwellings, historical shops, or old churches).

The economic impacts of investments in the cultural sector were subdivided into (1) effects on the production of art; (2) effects on all urban economic sectors; (3) effects on the built environment; (4) effects on the residential and locational climate. It is clear that some

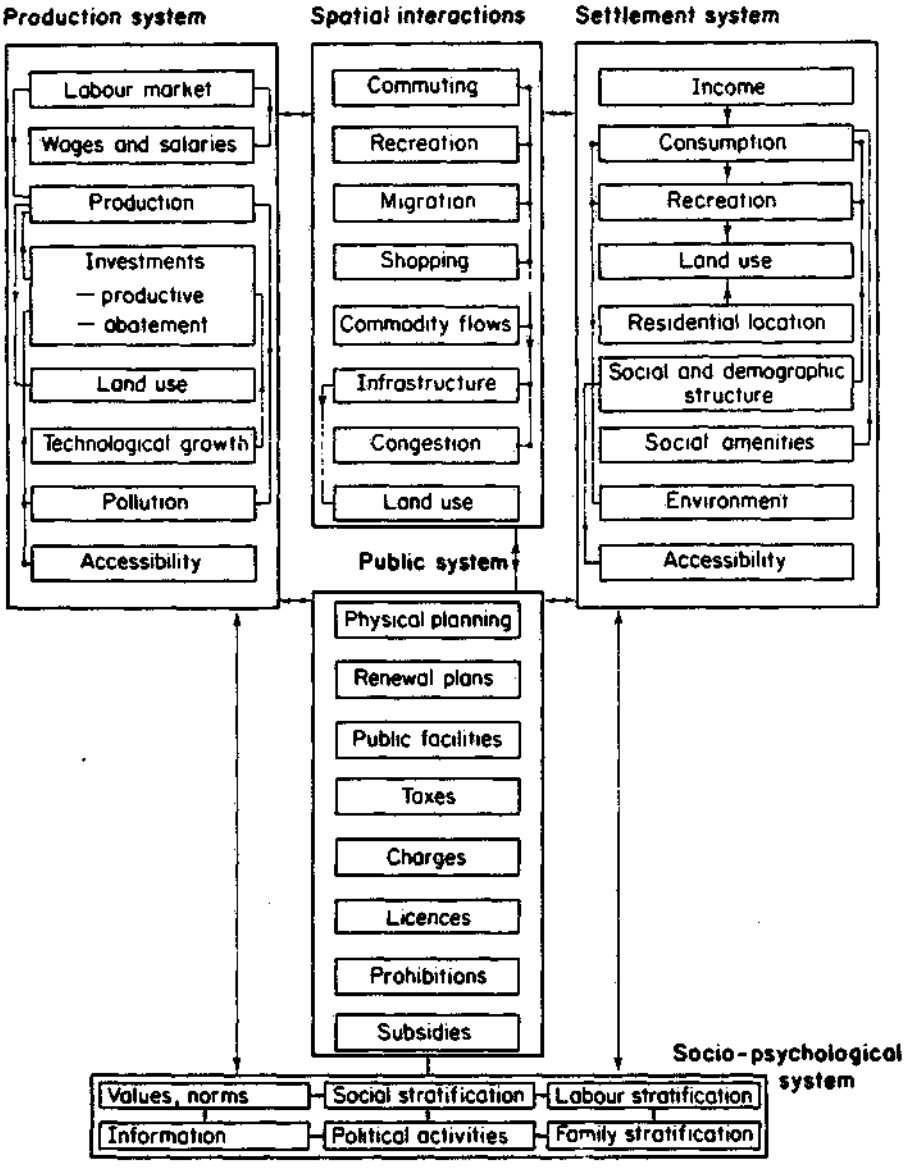

Figure 2. An illustrative spatial interaction system
Source: Nijkamp (1979, p. 24)

of these effects can be expressed in monetary units (e.g., value added); others can be quantified, but not in monetary terms (e.g., new jobs), whilst also qualitative effects can be distinguished that cannot be measured with a reasonable precision.

It turned out that investments in the cultural sector provided a synergetic effect on the general economic functioning of the city by increasing its attractiveness as a shopping, recreational and residential centre.

Studies of this nature also call for due attention to be given to the spatial demarcation of the area under consideration. In the next section this issue of so-called spatial impact analysis will be considered in more detail.

4. Spatial Impact Analysis

After the general discussion of impact assessment analysis, we will now turn to spatial impact analysis. Spatial systems (cities, rural areas, regions) are influenced by a number of external forces, among which - in addition to exogenous factors (for instance, international developments such as a rise in oil prices) - government policies have great significance. In this paper, particular attention will be paid to the impacts of policy measures.

Government actions that affect spatial units can broadly be divided into two categories: first, actions that directly aim at influencing the spatial system concerned, and secondly, actions that are not primarily directed towards this system, but may have unintended impacts on this system. The second group, which may consist **inter alia** of industrial, agricultural etc. measures, influences geographical patterns of cities and regions sometimes in a decisive way, sometimes even without the planner's prior knowledge. Thus, both types of policies may imply impacts on spatial systems.

Spatial impact analysis may be defined as a systematic and coherent organization and application of established analytical techniques to assess the expected or foreseeable impacts (both intended and unintended, both direct and indirect) of various policy measures or programs at various administrative levels upon relevant welfare indicators of cities or regions. Examples of such impact analyses are: the impacts of a national energy programme for a specific region, or the impacts of a new infrastructural policy on a specific city.

Spatial impact analysis aims at providing an integrated (rather than a partial) picture of the consequences of a public policy plan (or of a set of such plans) for regions, rural areas or cities. Clearly, the spatial dimension of government actions gets more attention by applying this method. In this paper, we confine ourselves mainly to **regional** and **urban** impact analysis.

Various studies in the field of spatial impact analysis can be found in Pleeter (1980). A general framework for spatial impact analysis will first be presented in order to highlight the three major components of spatial impact analysis.

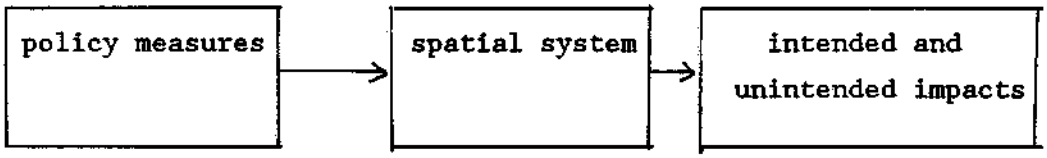

Figure 3. Three main components of a spatial impact analysis.

The first component is related to **government policies**. In principle, it can be safely assumed that measures of all policies will have impacts on cities or regions. These policies may relate to urban and non-urban fields, and may be pursued at various institutional levels (international, national, regional and urban). Hence, policies related to various fields and various institutional levels will have a relevance for spatial systems.

On the basis of Fig. 4, a multi-level multidimensional vector of policies (a so-called policy profile) can be constructed (see Nijkamp, 1979).

This multidimensional profile approach is also a meaningful analytical method for dealing with various **spatial systems**. Attention should be paid to the variety, coherence and institutional framework of the spatial unit at hand. This implies that normally economic, spatial, social and environmental aspects of the spatial system would have to be included. The multidimensional approach can be used to consider the wide variety of relevant aspects in a city or a region, as in such a case a certain phenomenon is characterized by a vector profile, with a set of different (multidimensional) components or attributes. For instance, urban quality of life is a multidimensional phenomenon which can only be presented in a useful way by means of a vector with such elements as the

quality, size and rent of dwellings, the availability of recreation areas, congestion etc.

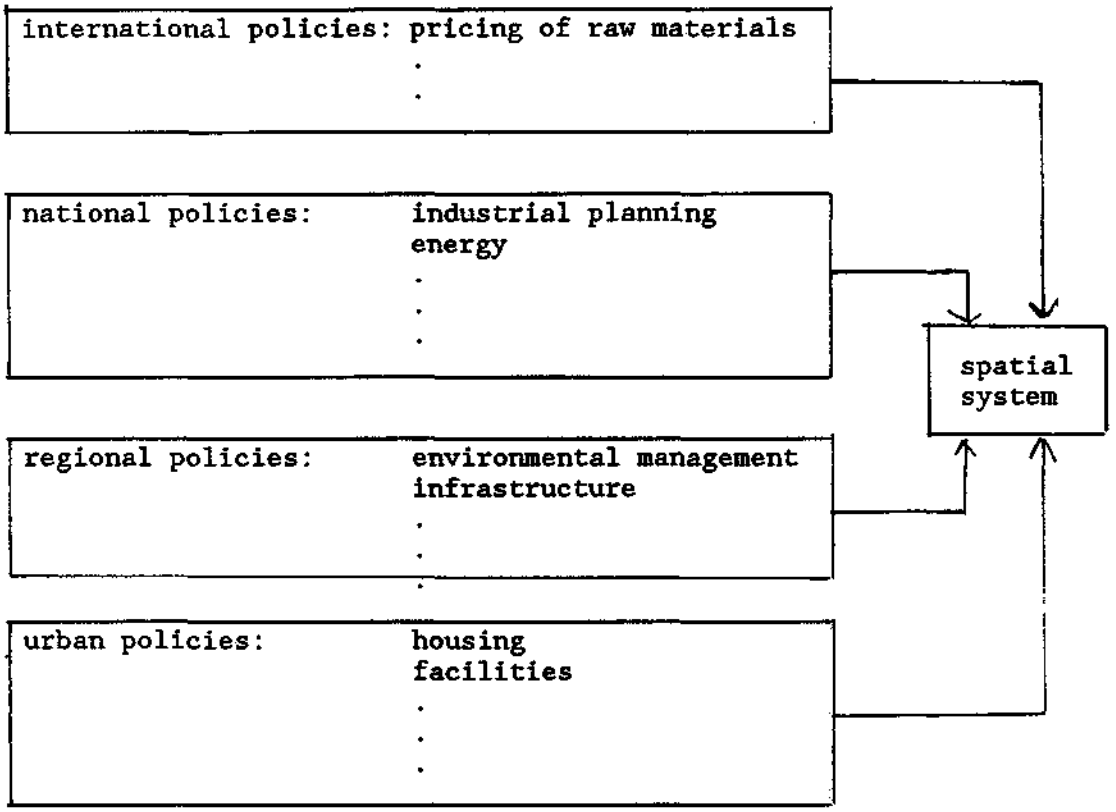

Figure 4. Sectors and levels of spatial impact analysis

Finally, the **impacts** of all policy measures on the spatial unit at hand have to be assessed. Here various methods can be used: econometric techniques, input-output analysis, economic base approaches, ad hoc assessments etc. Assuming alternative measures or policy controls, it may be useful to employ an **impact matrix** which reflects the impacts of alternative policies on the elements of the multidimensional profile of the spatial system at hand (see also Figure 1).

In this context, it is noteworthy that a well-known problem inherent in any kind of spatial impact analysis is the **spatial demarcation** of the system concerned (in terms of cities, regions, etc). From an analytical point of view, the spatial demarcation might be based on functional linkages between the spatial entities of the systems at hand, although data availability very often hampers the application of this standpoint. From a planning point of view, the spatial demarcations might be based on the existing administrative framework, although here also data problems may emerge.

Besides, the **time dimension** in spatial and urban impact analysis has to be mentioned. Usually, an impact study is only based on a comparative static framework, so that a (dynamic) transition path is left out of consideration. The lack of reliability and validity of dynamic spatial and urban models hampers an application of these models in the field of impact studies. In this respect, many research efforts still have to be undertaken so as to reach a meaningful use of dynamic spatial models. In any case, it may always be worth while to make a distinction between impacts from the **construction** and the **operating** stage of a project, respectively. It should also be noted that - despite the absence of operational dynamic models - it may be meaningful to employ a step-by-step impact analysis, so that the direct and indirect impacts of policy measures can be analyzed in a series of sequential stages.

The **range** of impacts to be taken into account depends on the policy interests of federal, regional and urban governments. The choice regarding both the number of profiles and the specific attributes of each profile is evidently also a policy decision, but it is clear that each specific set of impacts to be assessed should satisfy methodological requirements like systematics, coherence and completeness.

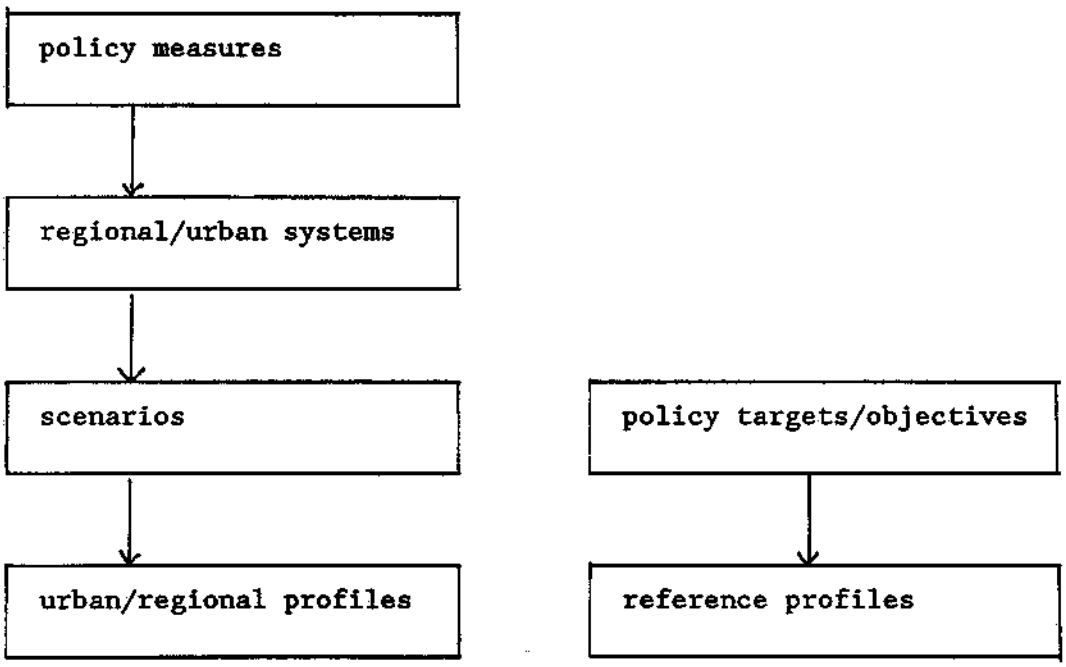

Figure 5. A stimulus-response spatial impact system

The above mentioned impact system can easily be extended with a scenario analysis. A scenario analysis serves to investigate the impacts of (hypothetical) policy measures, so that these impacts can be confronted with (or judged on the basis of) a reference profile (e.g., a target profile) arising from policy targets or general objectives. The following stimulus-response system may clarify the foregoing remarks:

Finally, due to uncertainties regarding policy measures or even lack of insight into the structure of complex urban or regional systems, the impacts cannot always be gauged in quantitative terms. Often, only qualitative statements will be possible. In this case qualitative assessment methods can be useful. Such methods attempt to develop an operational framework for gauging regional and urban impacts of public policies that is oriented towards the needs and popssibilities of developing countries (Nijkamp and Van Pelt, 1989). A qualitative assessment implies that effects are not necessarily measured on a cardinal scale.

When only one policy or plan is considered, ordinal, verbal, nominal or binary statements may be made, for instance, ++, +, 0, -, --, ?. These symbols mean respectively: relative large positive impact, relative small positive impact, negligible impact, relatively small negative impact, relatively large negative impact, unknown impact. Other possibilities are **inter alia** 'high' or 'low', or even 'yes' or 'no'.

Also ordinal rankings (e.g., 1, 2, 3) may be used, e.g., when comparing the impacts of a plan on the various elements of the system, or - in the case of a scenario - when comparing the impacts of the various measures on these elements.

5. Economic Evaluation

Impact assessment methods are a necessary component of any meaningful economic evaluation methodology, and hence also in conservation planning. Evaluation refers here to 'the means of aiding the selection by the decision makers (those commissioning the plan) as to which of alternative plans they will adopt as the 'best' for the community for whom they are planning; or aiding the planners themselves during the planning process in the similar need for selection, that is the rejection of alternatives that they do not intend to offer to the decision makers for adoption' (Lichfield, 1970, p. 151). In Lichfield's contribution various test criteria for plan selection have been specified, such

as internal consistency, locational suitability, conformity to standards and principles, problem solving, feasibility, design, flexibility and open-endedness. The author also reviews various plan evaluation methodologies, such as the planning balance sheet method, checklists of criteria, financial investment appraisal, economic investment appraisal, goals achievement, cost minimization, cost effectiveness, and cost-benefit analysis.

Public policy serves normally to improve national welfare. In order to achieve this, public expenditures are to be made, but these expenditures are not made in the aggregate but for specific goods and services in the framework of designated plans or projects. Thus all cost components have to be measured as accurately as possible. Furthermore, the aim of national welfare is very broad and needs to be more focused, as usually not all individuals, groups or regions in society will benefit to the same extent from a plan or project. Thus, plans or projects have to be evaluated with a view to their foreseeable impact on different groups or regions in a society. Consequently, measurement of costs, measurement of benefit and assessment of distributive effects are necessary.

In the conventional economic evaluation of monuments an attempt is made usually at using the measuring rod of money for evaluating the direct and indirect effects of recreational commodities, on the basis of, inter alia, the notion of consumer surplus (incorporating also the so-called travel cost method). This consumer surplus represents the financial sacrifices (in terms of distance and time) a visitor is willing to make (the so-called willingness to pay) minus the actual costs of a visit (see also Sinden and Worrell, 1978). Usual research methods used to assess this willingness-to-pay are inter alia survey techniques and interviews. A major problem in this case is the specification of a demand function, because of heterogeneity among individual users, the importance of remaining (omitted) explanatory variables, synergetic effects caused by other recreation users (congestion, for example), the evaluation of time (or time preference), and the intangible nature of a historico-cultural heritage. This historico-cultural heritage encompasses a wide variety of (mainly public) capital goods embodying (part of) the history of a country, region, or city.

Beside its historical, artistic, or scientific value (the symbolic heritage function), cultural heritage usually also has an actual user value, as well as a potential future value. Consequently, cultural

heritage may be conceived of as a resource with a high economic potential (Ashworth and Voogd, 1986). The importance of this resource is reflected in the average annual growth rate of approximately 5% in tourism and recreation in the past twenty-five years in many countries. The historic cities of Europe (London, Paris, Rome, Copenhagen, Amsterdam, Athens, etc.) house collections of cultural and historical artifacts of an intrinsic and important international dimension. Although the supply of cultural heritage is usually locally determined, the demand is dominantly non-local and frequently international. Clearly, demand is here mainly a response to the supply side, and consequently the planning and maintenance of the historic city are tasks of utmost importance (see also Ashworth, 1986; Burtenshaw et al, 1981; Dobby, 1978; Sinnott and Wall, 1980; Tarn, 1985; Ward, 1968; Williams et al, 1983).

A major instrument for enhancing the socioeconomic value of cultural heritage in historic city planning is the marketing of urban heritage so as to attract more tourism. But, in this respect, it is again important to gather adequate insight into the socioeconomic and historic-cultural value of monuments. As mentioned before, a conventional financial analysis has many limitations in assessing the cultural wealth incorporated in monuments.

In general, the measurement of costs and benefits is dependent on the policy objectives for a given project or programme. In implementing a project or programme, traditionally a fairly limited efficiency criterion has been used, viz. the maximization of the measurable economic benefit per unit of money invested, or the minimization of the unit costs attributable to a given investment. In such an accounting scheme, interpersonal comparisons of welfare or distributional impacts of a project or programme are usually left aside. Thus such a welfare function based on economic efficiency presuppose that maximimization of social welfare runs parallel to maximization of economic efficiency.

Furthermore, it is noteworthy that costs and benefits have to be assessed over a long time horizon, implying the use of a social rate of discount. Here two alternative approaches may be followed, viz. the net present value approach and the internal rate of returns. Clearly, the use of a given discount rate may have a considerable impact on the final inference regarding a project or programme (see Gijsbers and Nijkamp, 1988). To some extent one may argue that the choice of a social rate of discount rests also on distributive grounds, as in this case the interest of the present is traded off against that of the future.

The above mentioned three issues, viz. costs, benefits and distributive impacts, will now briefly be considered.

6. Measurement of Costs and Benefits

In general, the costs of a project or programme are made up by direct capital outlays for the implementation, the necessary wage costs, the factor supply costs, the overhead costs, the opportunity costs and the social costs (cf. Warnke et al., 1973). Social costs may either be quantifiable or not, but refer to all costs incurred which are not reflected in the usual market mechanisms. They will be separately discussed later on. In all cases it is desirable to measure costs in terms of current factor input prices (inter alia due to inflation).

In case of public project or plans market prices for goods and services are usually not available (see Edmunds and Letey, 1973), although for such cases proxy values for costs may be imagined and used, such as social marginal costs (i.e., a charge to the user of an output equal to the benefit received), shadow prices (e.g., based on a linear programming approach), and marginal costs (based on standard economic equilibrium assumptions).

An inherent problem in the measurement of costs is whether they can be separated from other costs and hence can be unambiguously attributed to the project or plan concerned (see also Wolfe, 1973). Infrastructure investments necessary for a new project or plan generate costs which cannot exclusively be attributed to a single use, as they have normally a multi-purpose character. Thus the allocation of such joint costs is one of the most complicated issues in public expenditure analysis (see also Fromm and Tauber, 1973).

Another problem concerns the measurement of indirect costs (i.e., costs not directly incurred in the construction and use of a plan or project). For instance, safety measures related to a new project may lead to higher additional costs than in the existing situation. Various ecological costs belong also to this category (e.g., climatic changes), although they are at the same time social costs.

Benefits refer to all economic consequences of a plan or project that increase social welfare. Several benefits can be directly attributed to a plan or project, whilst others are only indirect related to such decisions. In both cases, benefits can be expressed in monetary terms or not. In the latter case, benefits (e.g., employment effects)

may be either incommensurable (i.e., not transferable into the measuring rod of money although they may be quantifiable in other measurement units) or intangible. Intangible benefits do often occur in problems related to environmental, medical and cultural policy. Analogously to the measurements of costs, also benefit estimation is often hampered by the problem of joint and indirect benefits. A good illustration of such problems is the rehabilitation of an old monument. In such a case a derived benefit is the experience and expertise acquired in restoring this monument, so that this knowledge can also be used in other cases.

There is no need to mention here that in case of absence of a fully operating market mechanism the valuation of benefits in monetary terms is extremely difficult. Such issues of social benefits will be discussed in the next section.

Altogether, for the measurement of costs and benefits of a plan or project there is no single method available. The first starting point is a solid impact analysis (as discussed in sections 1-3), followed by an intellectual use of the economist's toolbox. In this context, Williams (1973) even raises the question whether cost-benefit analysis is a bastard science. It may be interesting to quote here Fromm and Tauber (1973):

> "While the calculus of cost-benefit analyses can do much to indicate the relative merits of proposed government expenditure projects (and other administrative actions that have economic or resource allocation implications), use of the technique by itself generally will not lead to optimum results from a social standpoint. This comes about because projects involve both tangible and intangible benefits and costs and also redistributive effects, which cannot be quantified in a fornm that permits them to be incorporated into formal cost-benefit calculations. Thus, the final choice of alternative projects becomes a matter of judgment and requires integration of the objectively determined merits and subjective evaluation of other effects of each of the alternatives. The choice finally evolves into decisions that must be reached within the framework of the political process. This is true in any society, whether it be organized along democratic lines or is centrally directed or totalitarian.
>
> This is not to say that, because of the subjective elements, the choices are arbitrary or illogical. Many of the effects not incorporated into the formal analysis can and should be quantified to some degree so as to narrow the scope of the subjective evaluation. For example, because redistributive

> impacts are often of great concern, project proposals should detail not only overall consequences (such as total costs expended and benefits generated) but also the implications for affected groups. To make rational choices it is necessary to know who benefits and who pays the costs (by income class, age, sex, race, and so forth), not only in the monetary terms but in a manner that indicates what the effects are on the quality of life."

7. Multiple Objectives

It has been taken for granted in the previous sections that economic welfare could be measured unambiguously by means of economic efficiency. This means of course a severe limitation of traditional cost and benefit assessment analysis. Eilon states, for example, in this context:

> "The economic approach is based on the assertion that expenditures of money for the good of the community must be guided by considerations of costs and financial benefits to that community, but it does not necessarily follow that - given the choice - the community will decide to use its resources according to economic criteria. For example, economic criteria may well suggest that all central parks in London should be turned over to property developers, or that some museums should be converted to office blocks, but it is very unlikely - thank goodness - that such criteria would prevail, even if the public were to be given clear and tangible evidence of the financial benefits of such schemes. Increased congestion, noise and air pollution, but in the main the loss of environmental amenities, outweigh the financial benefits, so that economic criteria become only a part of a very sophisticated array of goals in many dimensions."

One important objective which is often neglected in cost-benefit measurements is that of income distribution. Distribution and redistribution are in general very important in the social evaluation of projects or plans, as most expenditures, taxes and other government action will normally have different influences on different groups or regions in a national economy. The efficiency-equity dilemma is of paramount importance here. Unfortunately, it is almost impossible to translate (re)distributive impacts into the measuring rod of money, so as to make these compatible with the usual cost and benefit measurements. In conventional evaluation practice, the judgement of equity aspects is therefore often seen as a political responsibility to be left to a democratically elected policy agency. Nevertheless, this makes the

results of any cost and benefit assessment debatable, since equity aspects may also have second-order efficiency effects.

In many cases, however, there are alternative social welfare criteria, which also play an important role in any plan or project evaluation. Here we will consider a situation where multiple objectives may be distinguished each of them playing a certain role in the judgement of the performance of a plan or project. A simultaneous consideration of multiple objectives implies that we have to replace the market prices by artificial prices, based on the policymaker's judgement. Because a (public) investment project may be multidimensional, e.g., may cause very different effects, it might be impossible to find all the conversion factors necessary to compare those effects. How to weigh, for instance, the loss of natural beauty and the number of birds of passage killed by the power lines that guarantee uninterrupted supply of electricity to the location of consumers, be it residential area or an industrial estate?

Proceeding with the last example, we will consider here an investment in an project that, due to its design and its operation, gives rise to different combinations of aggregate consumption and environmental effects with the same amount of capital. In figure 6, these combinations are represented by the feasibility frontier F'F, of which only part AF reveals substitution of contributions to one objective for those to the other. Theoretically, knowledge about the policymaker's equal welfare curves W (= indifference curves, showing equally desirable contributions to the two objectives), would allow us to identify the optimal point as the point of tangency between AF and the highest W available, T.

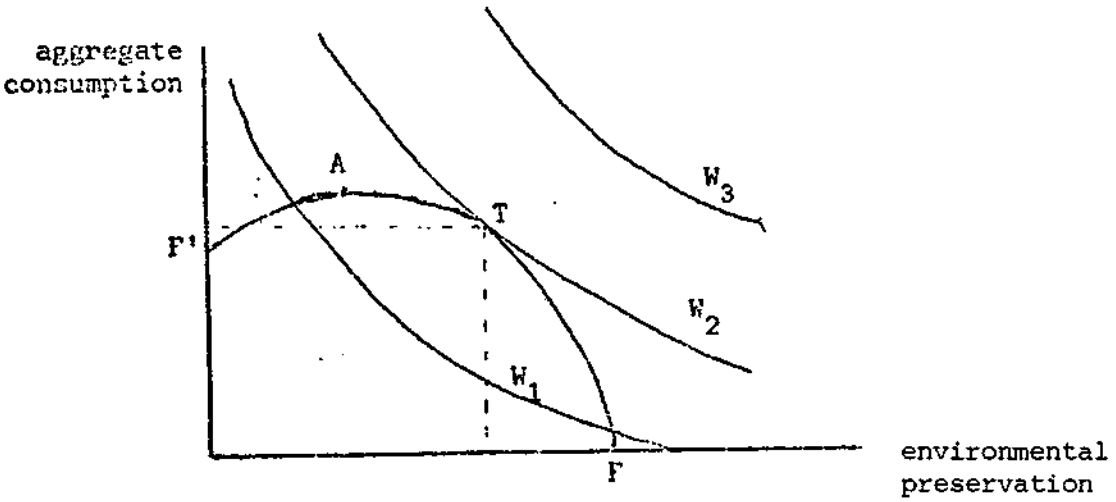

Figure 6. A trade-off curve between consumption and environment

As known from conventional economic theory, T is characterised by the equality of the marginal rate of substitution (m.r.s.) of aggregate consumption for environmental preservation (i.e., the slope of W_2 at T) and the marginal rate of transformation, i.e. (m.r.t.) the slope of AF at T. This marginal rate of substitution is at the same time the relative weight the policymakers, and the society, place on environmental preservation relative to aggregate consumption.

Should the investment project have effects on other objectives as well, then the condition of optimality has to be extended for every pair of objectives.

$$\text{m.r.s.}_{ij} = \text{m.r.t.}_{ij}$$

If aggregate consumption is chosen as the 'unit of account', the relative weights of the other objectives with respect to consumption are comparable and total benefits of each investment project (at one point in time) could be expressed as:

$$B = \sum_{i-1}^{I} w_i B_i$$

However, in reality the shape and position of the equal welfare curves, W, are unknown, and so are the relative weights w_i. Therefore, alternative approaches have to be chosen, which will be discussed in the next section.

This implies that in many practical situations a traditional cost-benefit assessment is hampered by severe limitations, originating from two sources:

- the existence of multiple objectives which lead to mutually unreconciliable welfare criteria; then there is no single 'measuring rod';
- the existence of social costs which due to marked imperfections cannot be translated into monetary units.

In various evaluation situations, these two issues may be interrelated. A good illustration can be found in the evaluation problem regarding the Norman Church of St. Michael at Stewkley, which stood in the middle of a possible runway of a possible Third London Airport (see Beer, 1971, and Churchman, 1974). This church reflected a social welfare component (i.e., an ancient monument) which could not be included in the economic efficiency accounts, as it represented a different objective or value. At the same time, the removal of the church would imply high social costs, as it concerned a unique monument.

8. Monetary and Multidimensional Approaches

In view of the above mentioned evaluation problems two different directions can be chosen. The first one is to take resort to standard economics and to make a systematic attempt at finding indirect ways of translating different objectives/criterion values and/or social costs and benefits into the measuring rod of money. Excamples can be found amongst others in:

- hedonic prices; in this case the intangible effects are gauged by investigating the indirect implications of social costs/benefits for marketable commodities; for instance, the effect of environmental pollution or noise annoyance on housing prices in the relevant area;
- contingent valuation; this method seeks to find a monetary value of a non-priced commodity by measuring indirectly the willingness to pay for this commodity on the basis of questionnaires, interviews, controlled experiments, etc. (see e.g. Harris et al., 1989 and Milon, 1989);
- Shadow project evaluation; this approach takes as a starting point the economic compensation principle for the loss of non-priced commodities and seeks to assess the costs (and possibly benefits) of reconstructing the same commodity (e.g., building up an old monument somewhere else etc.)(see Botterweg and Klaassen, 1976).

Such methods may offer interesting contributions to a monetary evaluation of aspects of relevant goods, projects or plans, but fail to provide a more comprehensive measure of economic value.

The second approach takes for granted that multiple objectives (e.g., equity considerations) and social costs are hard to translate into one common denominator. And hence, no attempt is made to create an artificial measurement scheme. In this framework, a multidimensional approach is normally followed.

A good example of such a multidimensional approach can be found in community impact analysis developed by Lichfield (1989). Community impact analysis serves to assess all relevant implications for all sectors of the community impactesd by the plan or project. In this way all groups (or regions) who benefit or lose from a plan or project have to be identified, including the types of impacts on their welfare. In this analysis, all distributive impacts but also all impacts on other relevant objective functions (e.g., monument conservation, environmental quality etc.) can be assessed. Community impact analysis needs normally

a large multidimensional array (or matrix scheme) in which all relevant consequences of all feasible alternatives are gauged. In general, community impact analysis is not making an explicit weighting of these impacts; it serves maily as a multidimensional policy impact assessment instrument.

Another example of a multidimensional approach to plan and project evaluation can be found in multiple criteria analysis. Multiple criteria analysis takes for granted the various steps necessary in a multidimensional impact assessment (for instance, community impact analysis) and tries to build upon a solid impact analysis a policy evaluation model. Multiple criteria analysis has become a popular tool in policy evaluation studies in many countries (see among others for a good overview Nijkamp et al., 1990). Seen from the viewpoint of conservation strategies, there is a need for an integrated cultural and functional economic urban development strategy, in which economic, social, architectural, and historical aspects of city life are brought into harmony. Therefore, it is no use looking exclusively at the cost side of monument policy. Monuments have a social benefit whose (economic, social and cultural) value is related to the history of society and is perceived by the present generation (including all direct and indirect users) in view of the future.

These benefits are clearly multidimensional in nature. Here a parallel may be drawn with antiquities sold on the market. The value of an antique good (a painting, for example) depends on its age, its state of preservation, its degree of uniqueness, its artistic quality, and its representation of a certain style period. The same holds true for an urban monument, although here an additional important consideration plays a role, namely its integration in the existing historical urban structure (in addition to the revenues generated by this historical cultural resource).

This implies essentially that an urban monument has to be valued from the angle of a multiattribute utility approach. Its value for society is determined by various attributes such as age, uniqueness, artistic value, style period, integration in urban structure, and economic revenues. The multidimensional profile constitutes the indigenous socioeconomic and historical-artistic value of a cultural resource, seen from the viewpoint of a multidimensional utility theory. In this context multiple criteria analysis has demonstrated its value (see also Nijkamp 1989), not only in the case of 'hard' (cardinal) information, but also in the case of 'soft' (qualitative) information. For

each level of measurement of information in a multidimensional evaluation analysis a corresponding suitable multiple criteria method can be identified.

References

Ashworth, G.J., 1986, Urban Tourist Resources, in The Impacts of Tourism on Disadvantaged Regions Eds. G.J. Ashworth, B. Goodall, Socio-Geografic Series, number 35, Geographic Institute, State University, Groningen, pp. 14-28.

Ashworth, G.J., Voogd, H., 1986, The Marketing of Urban Heritage as an Economic Resource, in Planning Without a Passport, Eds. J.J.M. Angenent, A. Bongenaar (Elinkwijk, Utrecht), pp. 38-50.

Becker, H.A. and A.L. Porter (eds.), 1986, Impact Assessment Today, (Jan van Arkel, Utrecht).

Beer, S., 1971, Questions of Metric, Operations Research Quarterly, vol. 22, pp. 133-144.

Botterweg, Th. and L.H. Klaassen, 1976, Project Evaluation and Intangible Effects, in Environmental Economics, vol. 1, Ed. P. Nijkamp et al. (Rotterdam University Press, Rotterdam), pp. 33-50.

Burtenshaw, D., Bateman, M., Ashworth, G.J., 1981 The City in West Europe (John Wiley, Chichester, Sussex).

Churchman, C.W., 1974, On the Facility, Felicity, and Morality of Measuring Social Change, in Accounting for Social Goals Eds. J.L. Livingstone and S.C. Gunn (Harper & Row, New York), pp. 16-21.

Dobby, A., 1978 Conservation and Planning (Hutchinson, London).

Driver, B.L., Harris, C.C., 1981, Improving Measurement of the Benefit of Public Outdoor Recreation Programs, in Proceedings for Outdoor Recreation Economics, Eds. E. Gundermann, H.F. Kaiser (IUFRO, Kyoto) pp. 289-302.

Edmunds, S. and J. Letey, 1973, Environmental Administration (McGraw-Hill, New York).

Eilon, S., 1973, Goals and Constraints in Decision-Making, in Accounting for Social Goals Eds. J.L. Livingstone and S.C. Gunn (Harper & Row, New York), pp. 218-230.

Filius, A.M., 1986, Kan en Moet de Waarde van Recreatie in Bossen in Geld Uitgedrukt Worden?, Beleidsanalyse, no. 1, pp. 10-21.

Fromm, G. and P. Tauber, 1973, Public Economic Theory and Policy, (MacMillan, New York).

Fusco Girard, L., 1987, Risorse Architettoniche e Culturali (Franco Angeli, Milano).

Gijsbers, D. and P. Nijkamp, 1988, Non-uniform Social Rates of Discount in Natural Resource Models, Journal of Environmental Systems, vol. 17, no. 3, pp. 221-235.

Greenley, D.A., Walsh, R.G., Young, R.A., 1981, Optn Value, Empirical Evidence from a Case Study of Recreation and Water Quality", Quarterly Journal of Economics vol. 95, pp. 657-673.

Harris, C.C., B.L. Driver, and W.J. McLaughlin, 1989, Improving the Contingent Valuation Method, Journal of Environmental Economics and Management, vol. 17, no. 3, pp. 213-230.

Hietbrink, S., E.M. van der Gulik and C. van der Vegt, 1988, Cultuur als Economische Infrastructuur, Research report, SEO, University of Amsterdam, Amsterdam.

Hyman, E.L., Hufschmidt, M.M, 1983, The Relevance of Natural Resource Economics in Environmental Planning, mimeographed working paper, The East-West Centre, Honolulu.

Kalman, H., 1980, The Evaluation of Historic Buildings (Ministry of the Environment, Ottawa).

Lichfield, N., 1970, Evaluation Methodology of Urban and Regional Plans: A Review, Regional Studies, vol. 4, pp. 151-165.

Lichfield, N., 1989, Economics in Urban Conservation (Cambridge University Press, New York).

Little, I.M.D. Mirrlees, J.A., 1974, Project Appraisal and Planning for Developing Countries (Heinemann Educational Books, London).

Milon, J.W., 1989, Contingent Valuation Experiments for Strategic Behavior, Journal of Environmental Economics and Management, vol. 17, no. 3, pp. 293-309.

Nijkamp, P., H. Leitner and N. Wrigley (eds), 1986, Measuring the Unmeasurable (Kluwer Nijhoff, Dordrecht).

Nijkamp, P., 1979, Multidimensional Spatial Data and Decision Analysis, (Wiley, New York).

Nijkamp, P., 1989, Quantity and Quality, Research Memorandum 1989-46, Dept. of Economics, Free University, Amsterdam.

Nijkamp, P., P. Rietveld and H. Voogd, 1990, Multiple Criteria Analysis in Physical Planning (North-Holland Publ. Co., Amsterdam).

Nijkamp, P. and H. Voogd, 1989, Conservazione e Sviluppo (Franco Angeli, Milano).

Nijkamp, P. and M. van Pelt, 1989, Spatial Impact Analysis in Developing Countries, International Regional Science Review, vol. 12, no. 2, pp. 211-228.

Pleeter, S., 1980, Economic Impact Analysis (Martinus Nijhoff, Dordrecht).

Renard, R., 1986, The Rise and Fall of Cost-benefit Analysis in Developing Countries, Paper Annual Conference of Flemish Economists, Brussels, October 1986; mimeographed obtainable from Department of Economics, Free University, Brussels.

Sinden, J.A., Worrell, R.C., 1978, Unpriced Values (John Wiley, New York)

Sinnott, J., Wall, G, 1980, Urban Recreational and Cultural Facilities (Canadian Geographer), vol. 24, pp. 50-59.

Taha, H.A., 1976, Operations Research (Macillan, New York).

Tarn, J.N., 1985, Urban Regeneration: the Conservation Dimension, Town Planning Review, vol. 56, pp. 245-268

Ward, P. (Ed.), 1968, Conservation and Development in Historic Towns and Cities (Oriel Press, c/o Routledge and Kegan Paul, Andover, Hants).

Warnke, D.W., N.C. Terre and A.P. Ameiss, 1973, A Methodology for Determining Public Investment Criteria, Socio-Economic Planning Sciences, vol. 7, pp. 317-326.

Warr, P.G., 1982, Shadow Pricing Rules for Non-traded Commodities, Oxford Economic Papers, vol. 34, pp. 231-243.

Weisbrod, B., 1964, Collective Consumption Services of Individual Consumption Goods, Quarterly Journal of Economics, vol. 78, pp. 471-477.

Williams, N., Kellogg, E.H., Gilbert, F.B., 1983, Readings in Historic Preservation: Why? What? How? (Center for Urban Policy Research, Rutgers University, New Brunswick, NJ).

Williams, A., 1973, Cost-Benefit Analysis : Bastard Science? And/or Insidious Poison in the Body Politick? in Cost Benefit and Cost Effectiveness Ed. J.N. Wolfe (Allen & Unwin, London), pp. 30-60.

Wolfe, J.N., Ed., 1973, Cost Benefit and Cost Effectiveness (Allen & Unwin, London).

1988-1	H. Visser	Austrian thinking on international economics
1988-2	A.H.Q.M. Merkies T. van der Meer	Theoretical foundations for the 3-C model
1988-3	H.J. Bierens J. Hartog	Nonlinear regression with discrete explanatory variables, with an application to the earnings function
1988-4	N.M. van Dijk	On Jackson's product form with 'jump-over' blocking
1988-5	N.M. van Dijk M. Rumsewicz	Networks of queues with service anticipating routing
1988-6	H. Linneman C.P. van Beers	Commodity Composition of Trade in Manufactures and South-South Trade Potential
1988-7	N.M. van Dijk	A LCFS finite buffer model with batch input and non-exponential sevices
1988-8	J.C.W. van Ommeren	Simple approximations for the batch-arrival $M^X/G/1$ queue
1988-9	H.C. Tijms	Algorithms and approximations for bath-arrival queues
1988-10	J.P. de Groot H. Clemens	Export Agriculture and Labour Market in Nicaragua
1988-11	H. Verbruggen J. Wuijts	Patterns of South-South trade in manufactures
1988-12	H.C. Tijms J.C.W. van Ommeren	Asymptotic analysis for buffer behaviour in communication systems
1988-13	N.M. van Dijk E. Smeitink	A non-exponential queueing system with batch servicing
1988-14	J. Rouwendal	Existence and uniqueness of stochastic price equilibria in heterogeneous markets
1988-15	H. Verbruggen	GSTP, the structure of protection and South-South trade in manufactures
1988-16	Mevr. H. Weijland Mevr. R. Herweijer J. de Groot	Female participation in agriculture in the Dominican Republic
1988-17	N.M. van Dijk	Product Forms for Random Access Schemes
1988-18	A.H.Q.M. Merkies I.J. Steyn	Adaptive Forecasting with Hyperfilters
1988-19	J. Rouwendal	Specification and Estimation of a Logit Model for Housing Choice in the Netherlands
1988-20	J.C.W. van Ommeren R.D. Nobel	An elementary proof of a basic result for the GI/G/1 queue
1988-21	H. Kool	A Note on Consistent Estimation of Heteroscedastic and Autocorrelated Covariance Matrices
1988-22	C.P.J. Burger	Risk Aversion and the Family Farm
1988-23	N. van Dijk I.F. Akyildiz	Networks with mixed processor sharing parallel queues and common pools
1988-24	D.J.F. Kamann P. Nijkamp	Technogenesis: Incubation and Diffusion
1988-25	P. Nijkamp L. van Wissen A. Rima	A Household Life Cycle Model For the Housing Market
1988-26	P. Nijkamp M. Sonis	Qualitative Impact Analysis For Dynamic Spatial Systems
1988-27	R. Janssen P. Nijkamp	Interactive Multicriteria Decision Support For Environmental Management
1988-28	J. Rouwendal	Stochastic Market Equilibria With Rationing and Limited Price Flexibility
1988-29	P. Nijkamp A. Reggiani	Theory of Chaos in a Space-Time Perspective
1988-30	P. Nijkamp J. Poot J. Rouwendal	R & D Policy in Space and Time
1988-31	P. Nijkamp F. Soeteman	Dynamics in Land Use Patterns Socio-Economic and Environmental Aspects of the Second Agricultural Land Use Revolution
1988-32	J. Rouwendal P. Nijkamp	Endogenous Production of R & D and Stable Economic Development
1988-33	J.A. Hartog E. Hinloopen P. Nijkamp	Multicriteria Methoden: Een gevoeligheidsanalyse aan de hand van de vestigingsplaatsproblematiek van kerncentrales
1988-34	R. van der Mark P. Nijkamp	The Development Potential of High Tech Forms in Backward Areas - A Case study for the Northern Part of The Netherlands
1988-35	E.R.K. Spoor J.W.B. Vermeulen	Principes en gebruik van Envisage
1988-36	C. Gorter P. Nijkamp P. Rietveld	The Duration of Unemployment: Stocks and Flows on Regional Labour Markets in the Netherlands
1988-37	M. Hofkes	Parametrization of simplicial algorithms with an application to an empirical general equilibrium model
1988-38	J. van Daal A.H.Q.M. Merkies	A Note on the Quadratic Expenditure Model